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COMMITTEE OF EXPERTS ON THE
TRANSPORT OF DANGEROUS GOODS
(Twentieth session,
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REPORT OF THE COMMITTEE OF EXPERTS ON ITS TWENTIETH SESSION (7-16 December 1998)

Addendum 2

Annex 2

GUIDELINES FOR ASSIGNING PORTABLE TANK REQUIREMENTS TO SUBSTANCES IN CLASSES 3 TO 9

1 These guidelines for assigning portable tank requirements to substances in Classes 3 to 9 are provided as a reference to be used for assigning portable tank requirements to specific substances. The guidelines were developed taking into consideration the hazards of dangerous goods and their physical and chemical characteristics.

2 The guidelines provide guidance for assigning specific requirements including minimum test pressures, minimum shell thicknesses, pressure-relief device arrangements and bottom opening closure requirements for portable tanks used to transport substances in Classes 3 to 9.

3 For certain substances the tank requirements recommended by these guidelines may not be appropriate owing to unique characteristics of the substance not addressed in these guidelines. In these instances expert judgement should be applied in assigning appropriate requirements. For example bottom openings may not be appropriate for substances corrosive to ship structures.

4 The guidelines are provided in two parts. Part I provides general guidance. Part II provides specific guidance for groups of substances organized on the basis of the Class or Division, Packing Group and subsidiary risk.

Part I
General guidelines

5. In assigning tank requirements to a substance the following should be taken into account:

5.1 ***Prohibited substances***: Some substances should be prohibited from transport in portable tanks. These substances are considered too dangerous for transport typically because of their instability or because they pose an unacceptably high level of risk when transported in bulk quantities under normal conditions of transport. The following substances are prohibited from transport in portable tanks:

- Substances of Class 1;
- Desensitised explosives in Division 4.1;
- Self-reactive substances (other than type F);
- Organic peroxides of Division 5.2 other than type F;
- Radioactive materials other than Low Specific Activity (LSA) non-fissile or fissile excepted materials.

Additional prohibited substances are specifically identified in the Model Regulations on the Transport of Dangerous Goods. Furthermore, some substances may only be transported on the basis of an approval by the competent authority.

5.2 ***Minimum shell thicknesses***: The minimum shell thicknesses prescribed are provided in thicknesses relevant to reference steel with a guaranteed minimum tensile strength of 370 N/mm^2 and a guaranteed minimum elongation of 27%. When other materials are used equivalent thickness calculations should be performed. Minimum thicknesses range from 5 mm to 10 mm. Part II of the guidelines provide guidance for assigning minimum thicknesses. Granular or powdered solid substances of packing groups II or III may be transported in tanks with minimum shell thicknesses of 5 mm in the reference steel regardless of the tank diameter when 6.6.2.4.2 of the Model Regulations on the Transport of Dangerous Goods is specified relevant to a given substance. Regardless of the minimum thickness specified in Part II, if the thickness determined in accordance with the provisions of sections 6.6.2.4 is greater, the greater thickness shall be applied.

5.3 ***Corrosive effects of substances on materials of construction***: The minimum thicknesses prescribed do not take a substance's corrosive effects into account. The consignor must ensure that the tank materials of construction are compatible with the lading.

5.4 ***Minimum test pressures***: Irrespective of the pressure assigned in these guidelines, the minimum test pressure assigned to an individual substance should be the greater of the pressure determined on the basis of the definitions in 6.6.2.1 of the Model Regulations and the pressure assigned in these guidelines.

5.5 ***Pressure-relief devices requirements***: Two pressure relief device requirements are possible,

(1) Normal (N) (where the provisions of paragraph 6.6.2.8.1 apply),or
(2) 6.6.2.8.3

When paragraph 6.6.2.8.3 is referenced, a frangible disk must be provided in series preceding the pressure relief device. Paragraph 6.6.2.8.3 should be assigned to substances that have the potential to polymerize or to produce solid or highly viscous substances capable of preventing proper operation of the relief valve.

In addition, 6.6.2.8.3 is also specified for certain groups of substances as indicated in Part II and for individual substances as indicated in the Dangerous Goods List of chapter 3 of the Model Regulations based on the decisions of the Committee of Experts.

5.6 ***Bottom openings***: Three possible bottom opening arrangements are proposed, 6.6.2.6.3 (which indicates three serially mounted means of closure), 6.6.2.6.2 (two serially mounted means of closure) or N.A. (Not Allowed). Bottom openings are not allowed for Packing groups I and II substances which are highly corrosive to steel.

5.7 ***Filling limits***: Three different filling restrictions are possible. The filling limits are considered operational requirements. The filling limits do not have a direct relationship to the construction of the tank or the arrangement of the service equipment. On this basis, filling limits are not addressed in Part II of this Annex and will not be included in the tank type designations. The maximum filling limit for a substance should be consistent with the provisions under "Filling" in Chapter 4.2 of the Model Regulations. The consignor of the dangerous goods has the ultimate responsibility for assuring portable tanks are not filled in excess of the specified limits for each substance, solution or mixture transported.

5.8 ***Molten substances***: Assignments for molten substances of all classes should be based on the requirements established for liquids of the same class, division, packing group and subsidiary risk of the substance.

Part II

Specific guidelines for assigning portable tank requirements to groups of substances

In assigning tank requirements to a substance the following shall be taken into account:

6.1 For substances in **CLASS 3, packing group III without a subsidiary risk** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T2 or T4	**1.5 bar */**	**6.6.2.4.2**	**Normal**	**6.6.2.6.3**

**/ A higher minimum test pressure may be required depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T4). A minimum test pressure of 2.65 bar applies for n.o.s. entries (T4), except as provided by the applicable tank provision.*

6.2 For substances in **CLASS 3, packing group III with a Division 6.1 or a Class 8 subsidiary risk** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T4 or T7	**2.65 bar */**	**6.6.2.4.2**	**Normal**	**6.6.2.6.3**

**/ A higher minimum test pressure may be required depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T7). A minimum test pressure of 4 bar applies for n.o.s. entries (T7), except as provided by the applicable tank provision.*

6.3 For substances in **CLASS 3, packing group II without subsidiary risks**, the following requirements shall apply:

Portable Tank Instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T4 or T7	**2.65 bar */**	**6.6.2.4.2**	**Normal**	**6.6.2.6.3**

**/ A higher minimum test pressure may be required depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T7). A minimum test pressure of 4 bar applies for n.o.s. entries (T7), except as provided by the applicable tank provision.*

6.4 For substances in **CLASS 3, packing group II with Division 6.1 or Class 8 subsidiary risks** the following requirements shall apply:

Portable Tank Instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T7 or T11	**4.0 bar */**	**6.6.2.4.2**	**Normal**	**6.6.2.6.3 **/**

**/ A higher minimum test pressure may be required depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T11). A minimum test pressure of 6 bar applies for n.o.s. entries (T11), except as provided by the applicable tank provision.*

***/ Bottom openings not allowed for substances which are highly corrosive to steel (T8).*

6.5 For substances in **CLASS 3, packing group I**, substances in **CLASS 3, packing group I with a Division 6.1 packing groups II or III subsidiary risk** and substances in **CLASS 3, packing group I with a Class 8 packing groups II or III subsidiary risk**, the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T11, T12, T15 or T16	**6 bar */**	**6.6.2.4.2**	**Normal **/**	**6.6.2.6.3**

**/ A higher minimum test pressure may be required depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T15 or T16).*

***/ Some substances in this category require 6.6.2.8.3 (T12 or T16).*

***Note**: For Class 3 Packing group I substances with subsidiary risks which are assigned to n.o.s. entries the guidelines in 6.6 shall be applied. Expert judgement may need to be applied owing to the unique characteristics of certain substances in order to determine bottom opening and pressure relief device requirements.*

6.6 For substances in **CLASS 3, packing group I with a Division 6.1, packing group I subsidiary risk**, and substances in **CLASS 3, packing group I with Class 8, packing group I subsidiary risk**, the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T14 or T19	**6 bar */**	**6 mm**	**6.6.2.8.3**	**N.A.**

**/ A higher minimum test pressure may be used depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T19).*

6.7 The following requirements shall apply for: **Flammable solids in DIVISION 4.1, packing groups II and III, Solid substances in DIVISION 4.2, packing groups II and III** *(none currently assigned to portable tanks)*, **Solid substances in DIVISION 5.1, packing groups II and III, Solid substances in DIVISION 6.1, packing groups II and III, Solid substances in CLASS 8, packing groups II and III, Solid substances in CLASS 9, packing groups II and III**

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T1, T2, T3, T4	1.5 bar*/	6.6.2.4.2 **/	Normal	6.6.2.6.3 ***/

*/ *A higher minimum test pressure may be used depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T3 or T4). A minimum test pressure of 2.65 bar may apply for some n.o.s. entries (excluding Division 4.1 substances) (T3 or T4), except as provided by the applicable tank provision.*

**/ *Granular or powdered solid substances may be transported in tanks with minimum shell thicknesses of 5 mm in the reference steel regardless of the tank diameter.*

***/ *All granular or powdered solid substances and some highly viscous or crystallizable substances are permitted to be transported in portable tanks with two serially fitted and mutually independent shut-off devices in accordance with 6.6.2.6.2 (T1 or T3).*

6.8 For **liquid** substances in **DIVISION 4.2, packing group I** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T21	10 bar	10 mm	Normal	N.A.

6.9 For substances in **DIVISION 4.3, packing groups II and III with or without subsidiary risks** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T7	6 bar	6.6.2.4.2	Normal	6.6.2.6.3

6.10 For substances in **DIVISION 4.3, packing group I with or without subsidiary risks** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T9, T10, T13 or T14	4 bar */	6 mm	Normal **/	N.A.

*/ *A higher minimum test pressure may be used depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations.(T13 or T14).*

**/ *Some substances (e.g. chlorosilanes) require 6.6.2.8.3 (T10 or T14).*

6.11 For **solutions of solid oxidizers in DIVISION 5.1, packing groups II and III**, the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T4 or T7	2.65 */	6.6.2.4.2	Normal	6.6.2.6.3

*/ *A higher minimum test pressure may be used depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T7).*

6.12 For substances in **DIVISION 5.1, packing group II (hydrogen peroxide solutions) with a subsidiary risk of Class 8** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T7	4 bar	6.6.2.4.2	Normal	6.6.2.6.3

*/ *Certain substances require a venting device.*

6.13 For substances in **DIVISION 5.1, packing group I with subsidiary risk of Class 8** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T10 */	4 bar	6 mm	6.6.2.8.3	N.A.

*/ *Several substances in this group are assigned tank requirements based on expert judgement owing to their unique characteristics.*

6.14 For substances in **DIVISION 5.1, packing group I with a Class 8 and a Division 6.1 subsidiary risk** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T22	10 bar	10 mm	6.6.2.8.3	N.A.

6.15 For substances in **DIVISION 5.2, packing group II (type F organic peroxides)** and **self-reactive substances, type F, in DIVISION 4.1**, the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimun shell thickness	Pressure relief device	Bottom openings
T23	4 bar	6.6.2.4.2	6.6.2.8.2 4.2.1.13.6 4.2.1.13.7 4.2.1.13.8	6.6.2.6.3

Note: Organic peroxides, type F and self-reactive substances, type F, are only permitted in portable tanks when they are listed in Portable tank instruction T23. All others are prohibited unless approved by the competent authority.

6.16 For **liquid** substances in **DIVISION 6.1 packing group III** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T4 or T7	2.65 bar */	6.6.2.4.2	Normal	6.6.2.6.3

*/ *A higher minimum test pressure may be used depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T7). A minimum test pressure of 4 bar applies for n.o.s. entries (T7), except as provided by the applicable tank provision.*

6.17 For liquid substances in **DIVISION 6.1 packing group II with or without subsidiary risks** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T7 or T11	4 bar */	6.6.2.4.2	Normal	6.6.2.6.3 **/

*/ *A higher minimum test pressure may be required depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T11). A minimum test pressure of 6 bar applies for n.o.s. entries (T11), except as provided by the applicable tank provision.*

**/ *Bottom openings not allowed for substances which are highly corrosive to steel (TS).*

6.18 For substances in **DIVISION 6.1 packing group I with or without subsidiary risks** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T14 or T19	**6 bar */**	**6 mm**	**6.6.2.8.3**	**N.A.**

**/ A higher minimum test pressure may be required depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T19).*

6.19 [reserved]

6.20 Class 7 assignments are not dealt with in this document.

6.21 For **liquid** substances in **CLASS 8 packing group III** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T4 or T7	**2.65 bar */**	**6.6.2.4.2**	**Normal**	**6.6.2.6.3**

**/ A higher minimum test pressure may be required depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T7). A minimum test pressure of 4 bar applies for n.o.s. entries (T7), except as provided by the applicable tank provision.*

6.22 For **liquid** substances in **CLASS 8 packing group II with or without a subsidiary risk** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T7 or T11	**4 bar */**	**6.6.2.4.2**	**Normal**	**6.6.2.6.3 **/**

**/ A higher minimum test pressure may be required depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T11). A minimum test pressure of 6 bar applies for n.o.s. entries (T11), except as provided by the applicable tank provision.*

***/ Bottom openings not allowed for substances which are highly corrosive to steel (T8).*

6.23 For **liquid** substances in **CLASS 8 packing group I with or without a subsidiary risk** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T10 or T14*/	4 bar */	6 mm	6.6.2.8.3	N.A.

*/ *A higher minimum test pressure may be required depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T14). A minimum test pressure of 6 bar applies for n.o.s. entries (T14), except as provided by the applicable tank provision.*

** / *Several substances in this group are assigned tank requirements based on expert judgement owing to their unique characteristics.*

6.24 For **liquid** substances in **CLASS 9**, the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell trickness	Pressure relief device	Bottom openings
T2 or T4	1.5 bar */	6.6.2.4.2	Normal	6.6.2.6.3

*/ *A higher minimum test pressure may be required depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T4). A minimum test pressure of 2.65 bar applies for n.o.s. entries (T4), except as provided by the applicable tank provision.*

6.25 For **elevated temperature substances** in **CLASS 9** the following requirements shall apply:

Portable tank instruction	Minimum test pressure	Minimum shell thickness	Pressure relief device	Bottom openings
T1 or T3	1.5 bar */	6.6.2.4.2	Normal	6.6.2.6.2

*/ *A higher minimum test pressure may be required depending on the absolute vapour pressure of the substance at 65 °C and the pressure prescribed using the definitions for design and test pressure in paragraph 6.6.2.1 of the Model Regulations (T3).*